Title: Animal Expo

Brief Overview:

This lesson applies the concepts of perimeter and area. It is expected that students have experience with generating arrays and using one-inch grid paper. Vocabulary included in these lessons are area, perimeter, and square units.

During this lesson students will create animal exhibits to design a diagram of a zoo. The class will be provided with a class model of a diagramed zoo. This model will help them understand how to apply perimeter and area concepts in a real-life scenario.

NCTM Content Standard/National Science Education Standard:

Apply appropriate techniques, tools and formulas to determine measurements

- Develop strategies for estimating, the perimeters, areas, and volumes of irregular shapes
- Develop, understand, and use formulas to find the area of rectangles and related triangles and parallelograms

Grade/Level:

Grades 3-4

Duration/Length:

Three class sessions, approximately 60 minutes per session

Student Outcomes:

Students will:

- Use standard units to find the perimeter and area of a shape
- Represent and organize data using grid paper

Materials and Resources:

Day 1

- Teacher Resource 1A-F class zoo (This has to be put together by teacher and provided for each group of students)
- Teacher Resource 7A-F class zoo with animal cage labels
- Teacher Resource 2A-B– word wall cards
- Teacher Resource 3A-B– vocabulary model perimeter and area
- Teacher Resource 4 – answer key assessment
- Student Resource 1A-B A,B,C rectangles (Have a set for each group)

- Student Resource 2 grid paper
- Student Resource 3 – vocabulary model
- Student Resource 4A-E –number cards
- Student Resource 5 – Exit Ticket Assessment
- Rulers
- Paper clips
- Unifix cubes

Day 2

- Spaghetti and Meatballs for All! by Marilyn Burns
- Student paper – lined or not
- Student Resource 6– "Gopher's Gone Missing"
- Student Resource 7– Dinner Party Exit Ticket Guest list: design a table to accommodate the participants. EXPLAIN WHY USING AREA AND PERIMETER?

Day 3

- Teacher Resource 1A-1F class zoo
- Teacher Resources 5A-B– differentiation cages answer key
- Teacher Resource 6– BCR explanation answer key
- Student Resource 8A-B– animal cards (four different animals)
- Student Resource 2
- Student Resource 9– place to draw cage and write explanation
- Student Resource 10– zoo directions
- Student Resource 11– table to answer area and perimeter
- Student Resource 12A-B– differentiation premade cages
- Student Resource 13 – BCR

Development/Procedures:

Day 1

Pre-assessment

- Divide the students will be in groups of 4.
- Assemble the Class Zoo pages and show the students (Teacher Resources 1A-F) the space available in the zoo and the distance around the zoo.
- Ask students to explain how they determined the space inside or distance around the outside.
- Ask several students: If you were to put a fence around the zoo, how much fence would you need?" In student explanations guide students to explain that they are determining the perimeter in units.
- Ask: How much space is available inside to design a zoo? Guide students to explain that they are determining the area.
- Display word wall cards and discuss definitions (Teacher Resource 2A-B).

Engagement

- Display a set of rectangles label A, B, C (Student Resource 1A-B).

- Invite the students to discuss the similarities/differences among the rectangles.
- Questions to ask students:
    - What are items in the classroom these rectangles could cover?
    - I covered a classroom items with rectangle ___. What might I have covered?
    - I covered two classroom items with rectangle ___. What might I have covered?
    - Which rectangle do you think has the greater perimeter?
    - Which rectangle do you think has the greater area?
    - What helped you to compare these rectangles?
    - How can we determine which one has the greater area?

Exploration

- Distribute the three rectangles to groups of four students (Student Resource 1A-B).
- Distribute Student Resource 2, rulers, unifix cubes, and paper clips (as a nonstandard measuring tool). Have students determine the perimeter and area of the rectangles using any of the provided materials. Students may choose to trace the shapes on grid paper or use rulers to determine measurements.
- Questions to ask students:
    - Can you demonstrate how you determined area and perimeter?
    - How did you solve it differently from other people in your group?
    - What happens if you try a different method? Do you come to the same conclusion?
    - Are there any other materials that can help to measure area or perimeter?
    - What did you do differently when determining the area or perimeter?

Explanation

- Display two vocabulary models (Student Resource 3) and ask students: What two kinds of measurement have we been using?
- Have groups of 4 complete one of the Vocabulary Models (Student Resource 3) so that half the class will define and give examples of area while the other half explains perimeter. Teacher Resource 3A-B provides sample answers.
- Have groups of students explain their Vocabulary Model definitions.
- Ask students how they can use their knowledge of area and perimeter in their daily lives.

Application

- Refer back to Class Zoo (Teacher Resource 1A-F).
- Distribute zoo cards containing animal picture, perimeter, and area information (Student Resource 4A-E). Cards should be cut and folded before distribution. Students will work with partners which will be determined by their animals.
- Explain that the numbers represent the area and perimeter of the animals' cages.
- Partners will use the numbers on the card to arrange one inch tiles with the correct area and perimeter of the rectangular shapes.
- Monitor as students discuss the arrangement of tiles. Groups of students can use the zoo poster at their seats to count the square units. For differentiation, some

students can be told which number is the area or perimeter. *Hint:* The number in the back is the perimeter.

- Questions to ask
    - How did you and your partner determine where your animal will live?
    - Why do you think your animal habitat has the shape, area, and perimeter that it has?
    - Are there any cages with the same perimeter or area? Why or why not?
    - How much space is left in the zoo for another animal? What kind of animal could use that space?
    - Do you think the zoo is organized to accommodate the most animals? How could you rearrange the animals to fit more animals?

Differentiation

- Reteach
    - Make a zoo poster (Teacher Resource 1A-F) available for a small group setting so that students can recreate the shapes using one inch color tiles. Once the student correctly maps out the animal's cage allow them to place their animal on the class zoo.
    - Perimeter: Have students use paper clips to fit around the side without overlap.
    - Area – Count the tiles they used when creating the shape.
- Enrich
    - Ask: Can you design an animal cage with an area of 20 square units? What are the possible perimeters? What are the possible shapes?
    - Have students continue to find the possibilities for these dimensions and cut each cage out.

Assessment

- Exit ticket (Student Resource 5) Choose an animal to add to the zoo. Draw the perimeter and area of the cage. Explain why the animal needs the specific area or perimeter using vocabulary from the lesson.

Day 2

Engagement

- Read the story Spaghetti and Meatballs for All! by Marilyn Burns.

Exploration

- Explain to students that we just read a story about how to rearrange tables to fit people at dinner. Now it is our job to design table placements for the Zoo Food Restaurant at the zoo.
- Using one student's desk as a model, demonstrate that there are four available spaces for students to sit (one on each side).
- Draw the diagram on the board for students to reference and have students copy the diagram on their grid paper (Student Resource 2).
- Have students copy the arrangement of their table group (desks) and determine the greatest amount of seats available.
- Questions to ask

- If a student moves a desk away, how would that affect the arrangement?
- How is this related to area or perimeter?
- How does rearranging our desks relate to the story we just read?

Explanation

- Distribute "Gophers Gone Missing" (Student Resource 6).
- Explain that because so many of the gophers dug holes and escaped, the zoo is planning to decrease some of their habitat.
- There is a related news article about the Maryland zoo and prairie dogs, which can be shared with students. http://www.baltimoresun.com/news/maryland/baltimore-city/bal-md.ci.zoo12jun12,0,685569.story
- Have students predict with neighbors what would happen if each of the corners was cut from the gopher exhibit.
- Questions to ask prior to cutting out the corners
  - How do you think the area will change?
  - How do you think the perimeter will change?
  - Do you think the area will be the same?
  - Do you think the perimeter will be the same?
  - Can you think of why the zoo planners need to know this kind of information?
- Instruct students to cut the corners from the gopher exhibit.
- Questions to ask after cutting out the corners
  - Did the area or perimeter change?
  - Can you explain why it did or didn't change?
  - What would happen if you cut a square from the center?"
  - What would be affected by the change in the gopher exhibit, the fencing or amount of grass to be cut.
  - How does this relate to the story we read concerning seating people in a restaurant?

Application

- Distribute Student Resource 2, one inch color tiles, blank paper, and rulers.
- Allow students to choose which materials they will use and have them arrange or draw tables that have the following:
  - One table, four seats
  - Two tables, six seats
  - Four tables, ten seats
  - Four tables, eight seats
- Questions to ask:
  - What are the different ways you can arrange 5 tables?
  - What is the greatest amount of people you can seat at these tables?
  - What is the least amount of people you can seat at these tables?

Differentiation

- Reteach

- Provide students with tile blocks and have students design shapes. As the shapes are created use paper clips to count the sides in order to determine the area.

- Enrich

  Have students design irregular shaped tables. The will challenge their partners to determine the perimeter of the table.

Assessment

- Have students complete an Exit Ticket (Student Resource 7 –answers will vary) to assess student understanding.

Day 3

Engagement

- Each group of four students will need precut animal card**s** from Student Resource 8A-B) and group zoo posters from Teacher Resource 1A-F).
- Have students decide which habitat would be appropriate for each animal..
- Questions to ask
  - Which cages would make a good habitat for your animal?
  - Why would this cage be appropriate for this animal?
  - How did your group decide the area needed for each animal?
  - Who needs the most or least amount of area or perimeter?
  - What factors could affect real zookeepers' decisions about where they place the animals?
- Ask groups to share information with the class. When all groups have shared, tape several animals into their exhibits.

Exploration

- Individual students will choose one animal from the four in the engagement activity. Using the area the group designated for that animal, students will create new cages wiyh the same area, but using different shapes. Each student in the group will choose a different animal and draw their cages on Student Resource 9.
- Have the students then break out into groups determined by the animal cage he/she drew. (example; all giraffes will be grouped).
- Have students share how they drew their animal cages with the same area, but using a different shape.
- Questions to ask:
  - How can different shapes have the same area?
  - Do you think that the perimeters are also the same?
  - What are the shapes of your cages?

Explanation

- Model ways to draw an appropriate cage for a specified area and write an explanation.(Teacher Resource 4).
- Students will then write their own explanation under their cage drawing (Student Resource 9 Step B)

Application

- Students will be given zoo directions (Student Resource 10).
- Students will choose no more than 5 animals and design a cage for each one. Students will specify area and perimeter of each cage.
- Students will need two copies of Student Resource 2 and glue them together to create the zoo space.

Differentiation

- Reteach
    - Students will be given premade cages (Student Resource 12A-B) and students will identify the perimeter and area of each shape. Students will cut out each cage and put it on grid paper (Teacher Resource 5A-B).
- Enrich
    - When designing the animal cages, have students include an information center. This center could be located anywhere in your cage. How does adding this center change the area and perimeter of the cage?

Summative Assessment:

- Students will be assessed on the accuracy of their zoo habitats and Student Resource 11
- Student Resource 13 (Teacher Resource 6)

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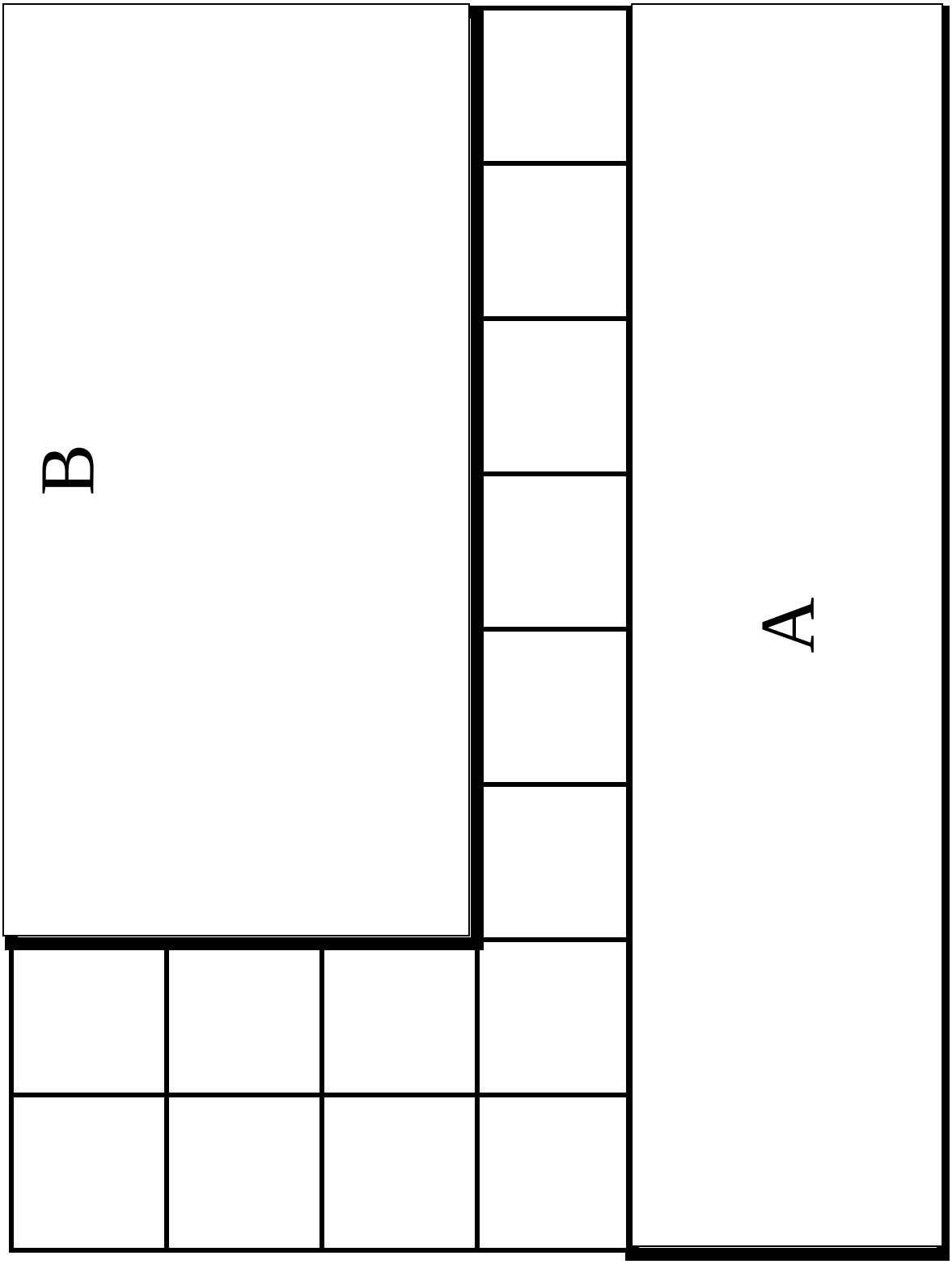
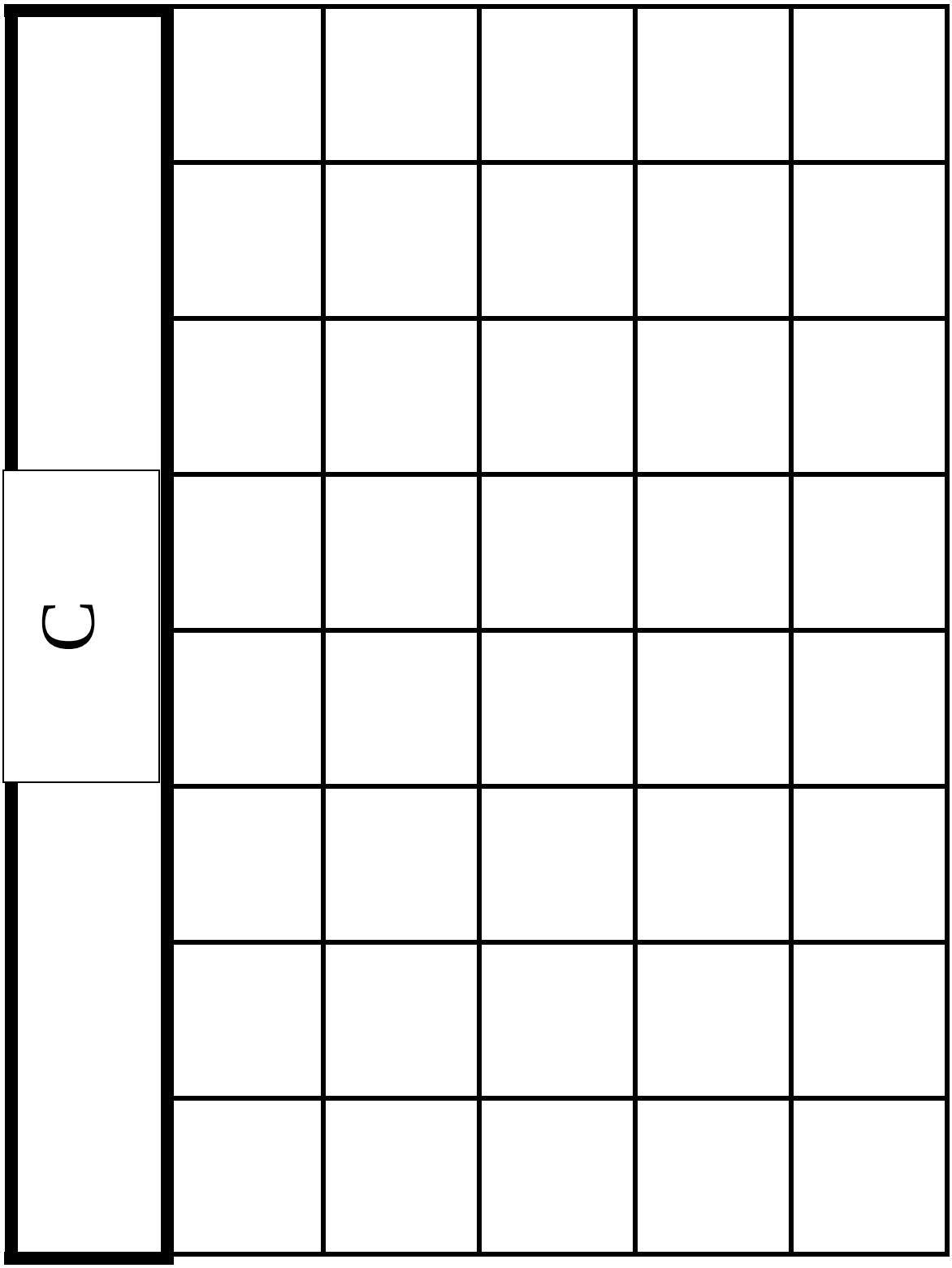
Student Resource 1A

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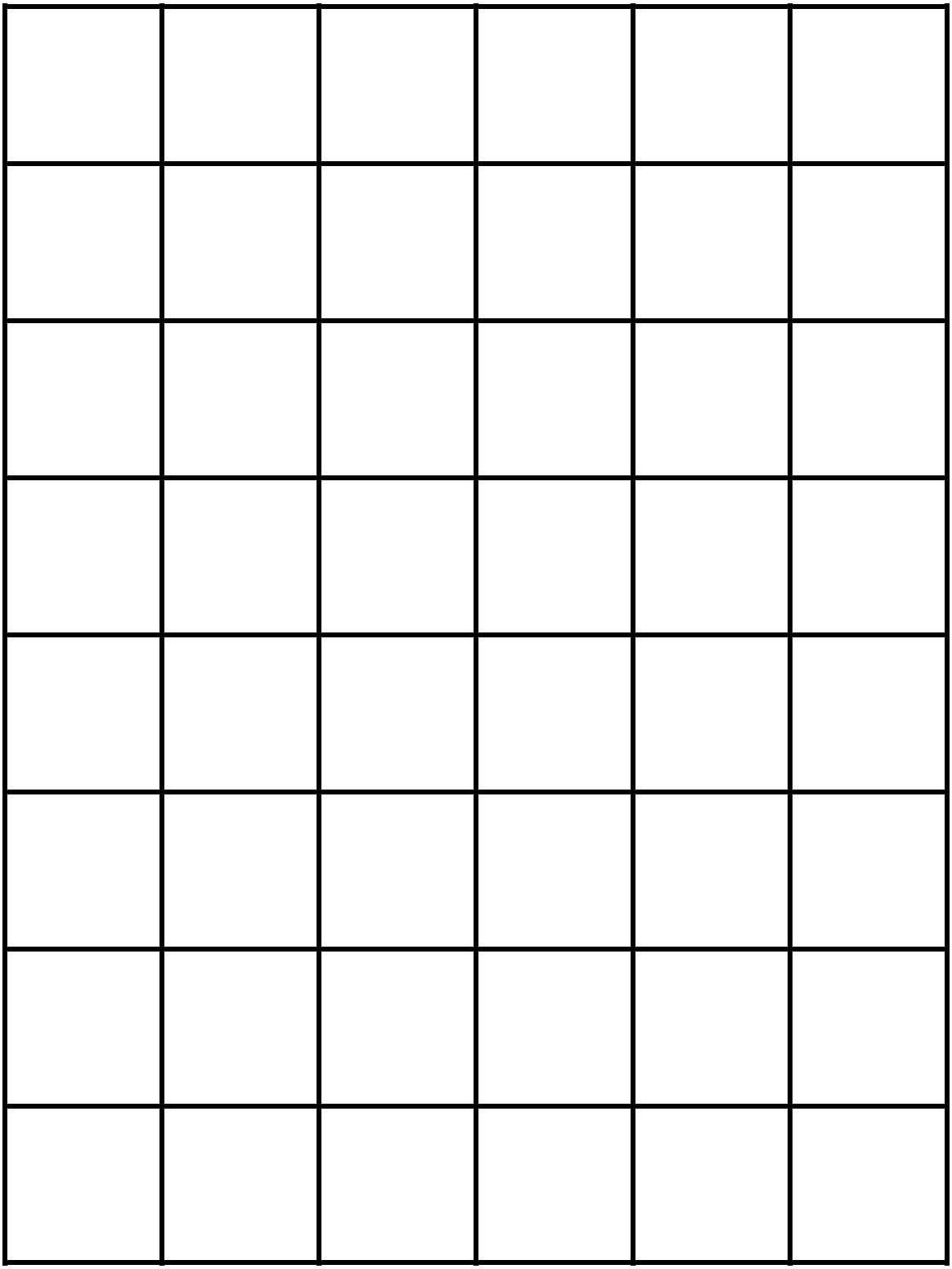
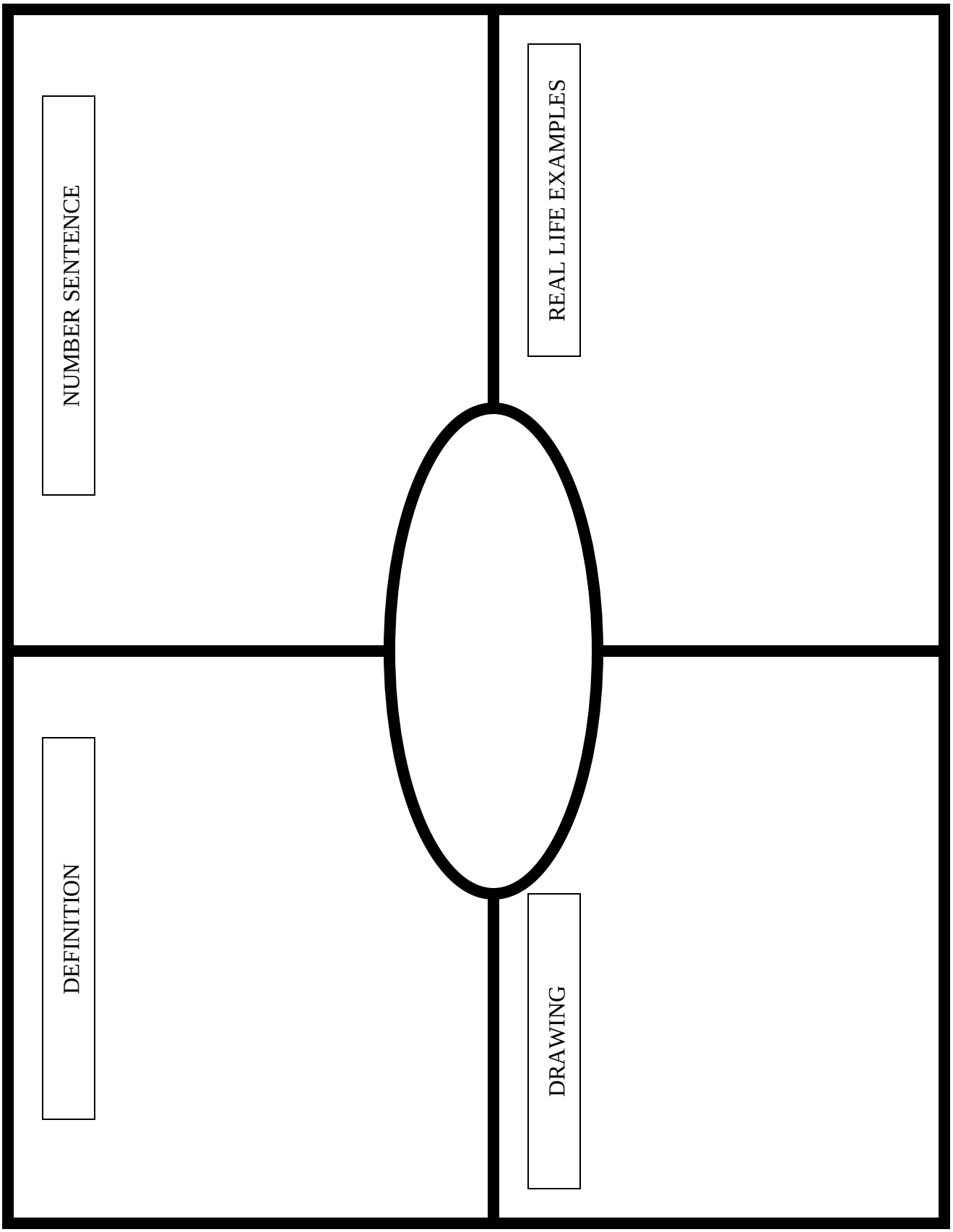
Student Resource 2

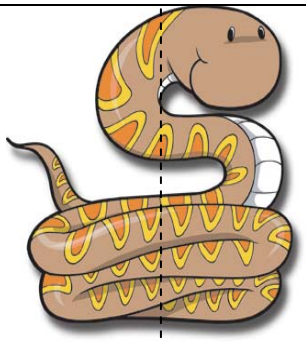


Student Resource 3



Student Resource 4A

Animal/Area/Perimeter Cards



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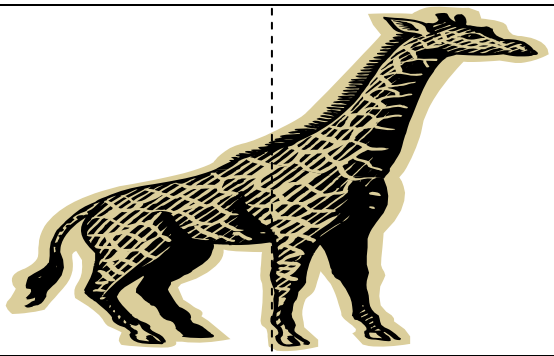

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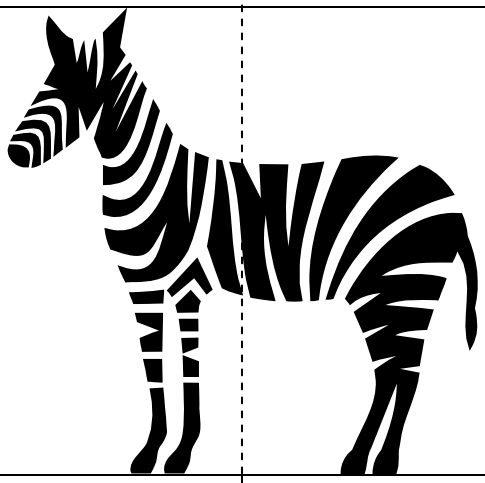

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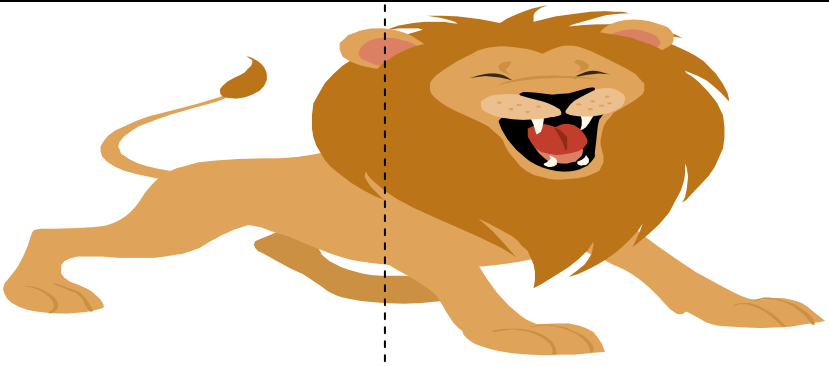

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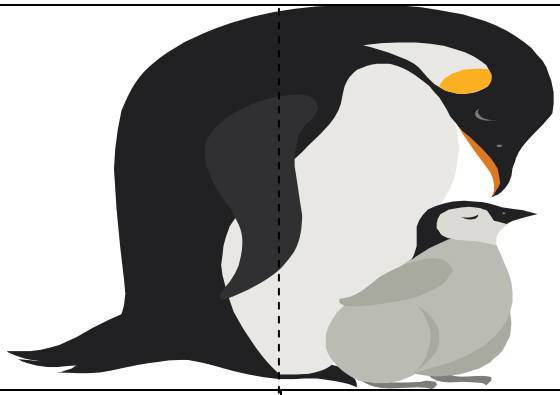

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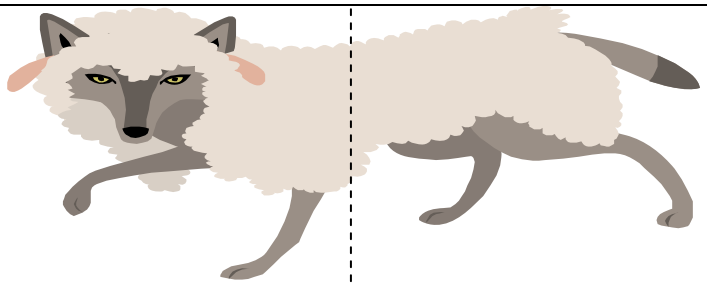

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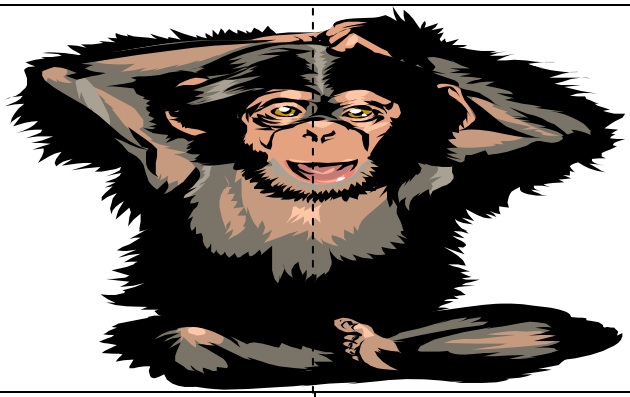

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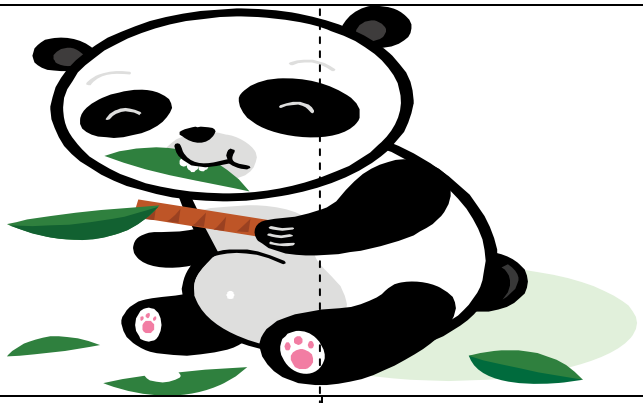

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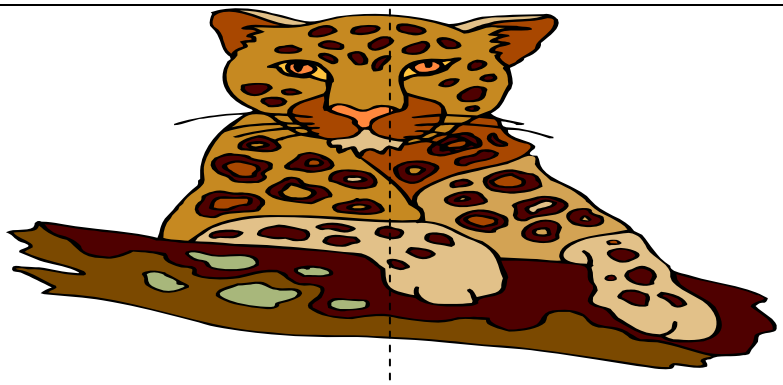

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Student Resource 5

Now that you have visited our class zoo, what animal, not found at our zoo, would you choose to make an exhibit for?

Draw a diagram of the cage you would use to hold your animal. Make sure to record the perimeter and area of your cage in units.

Perimeter _____

Area _____

Student Resource 5

Now that you have visited our class zoo, what animal, not found at our zoo, would you choose to make an exhibit for?

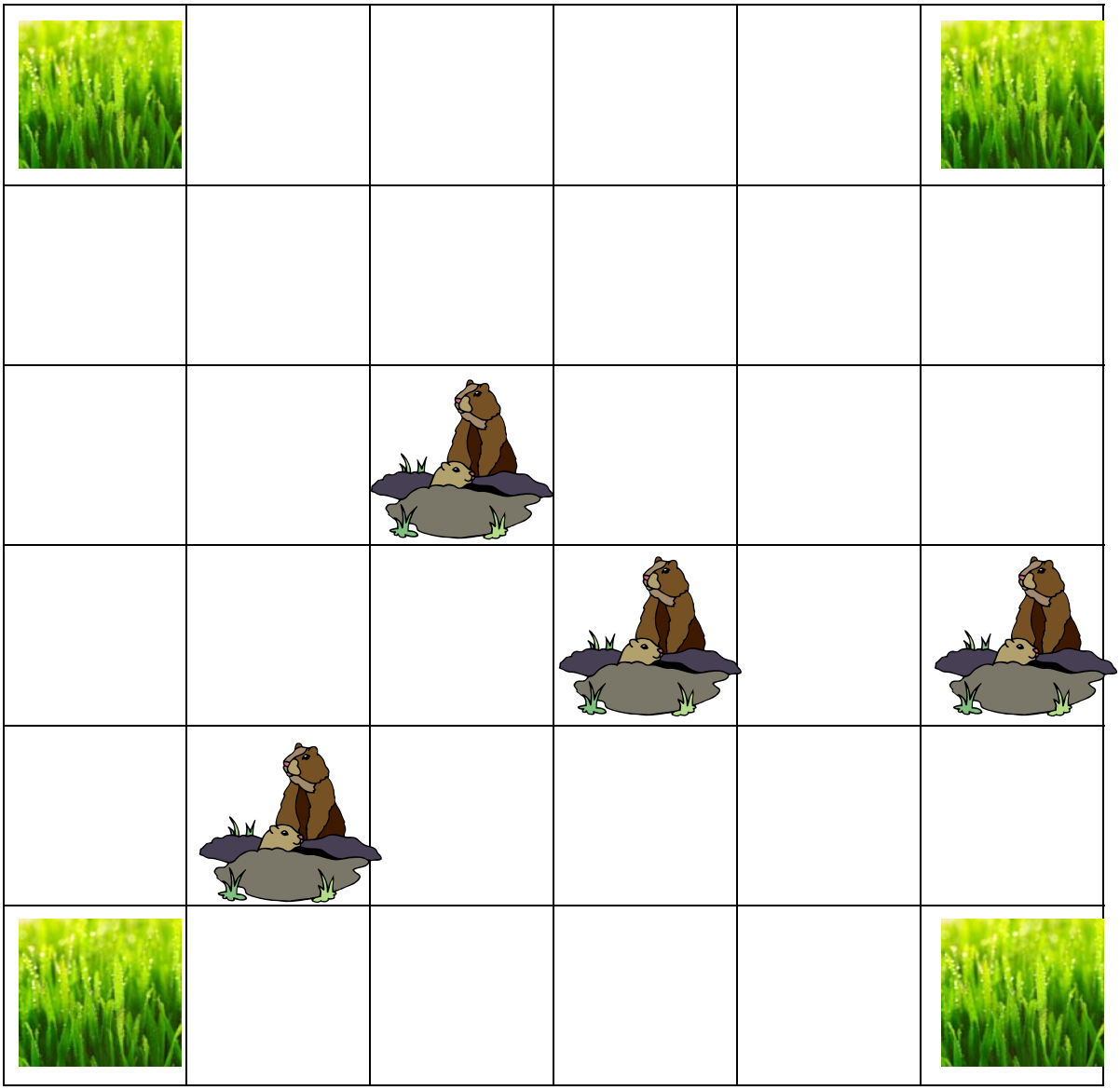
Draw a diagram of the cage you would use to hold your animal. Make sure to record the perimeter and area of your cage in units.

Perimeter _____

Area _____

Gophers Gone Missing!

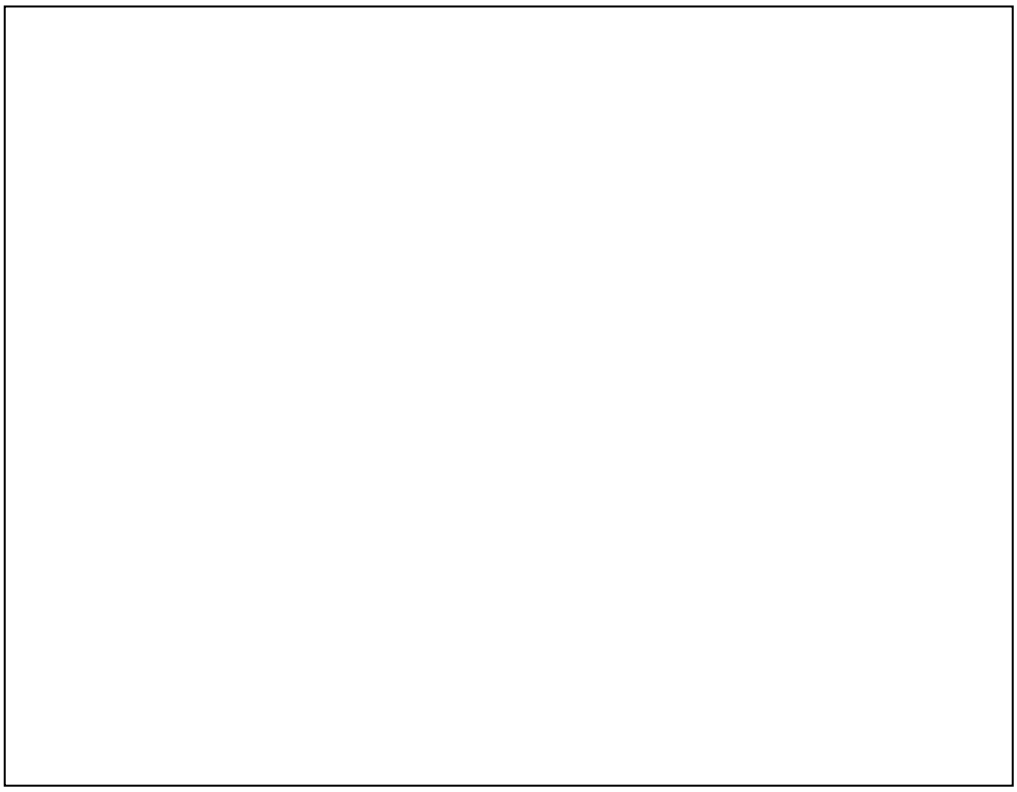
Gophers have dug holes and escaped the zoo. The zoo designer plans to decrease some of their habitat to make room for animals that stay in the zoo! Predict what would happen if each of the corners were removed from the gopher exhibit. Cut the grass and see what happens!



Dinner Party

Use the box provided to design a table to seat the participants of the guest list at a dinner party.

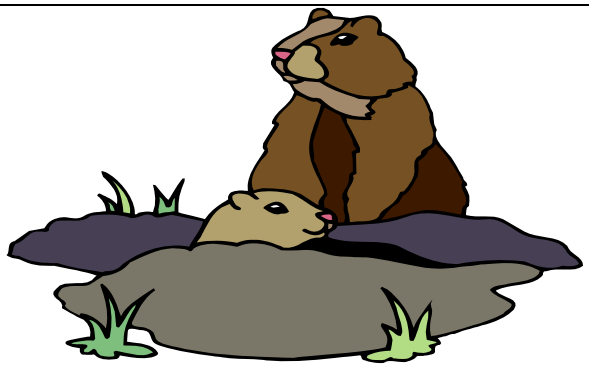
Guest List:
Elephant
Giraffe
Lion
Tiger
Bear
Eagle
Fox



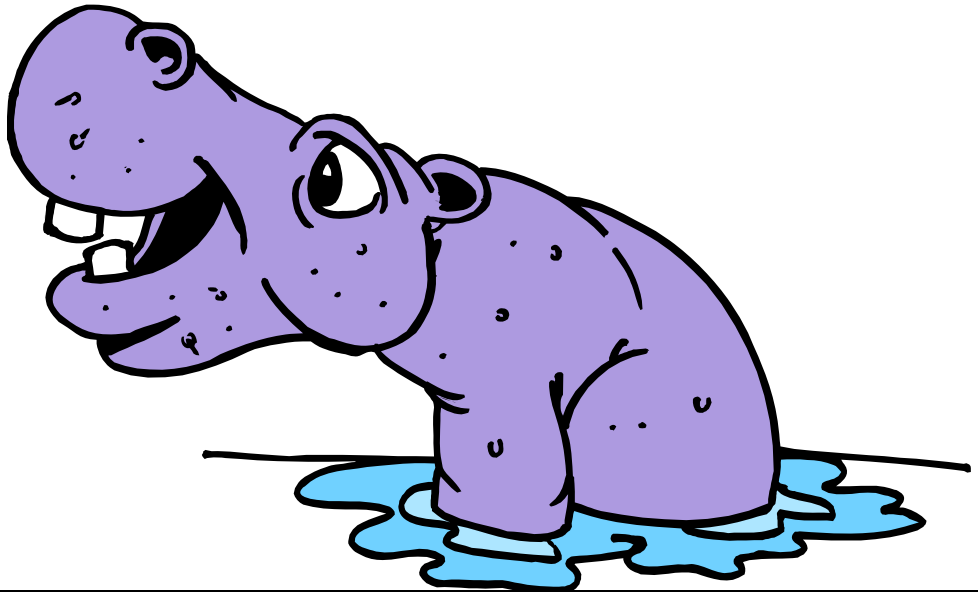
Explain how you designed your table. Use what you know about area and perimeter in your explanation.

Student Resource 8A

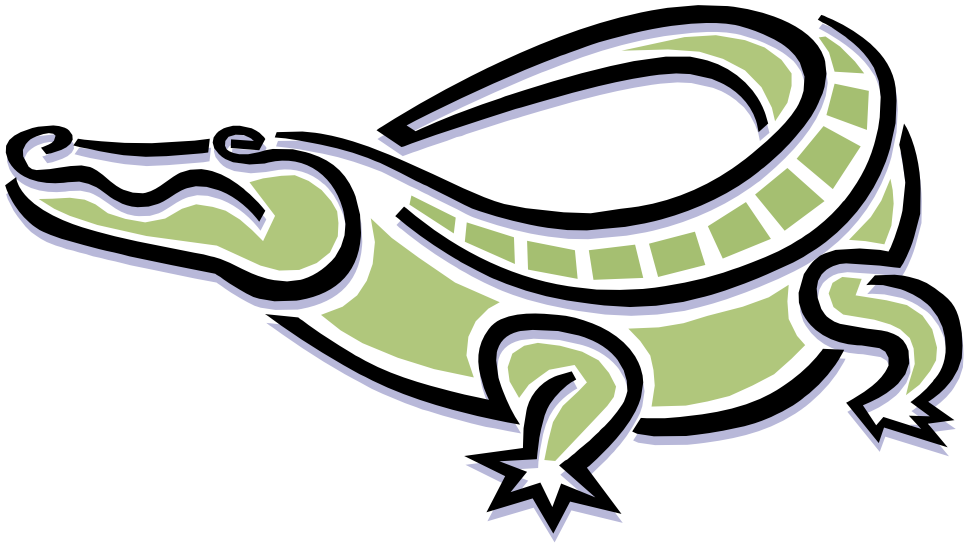
Animal Area Cards Day 3



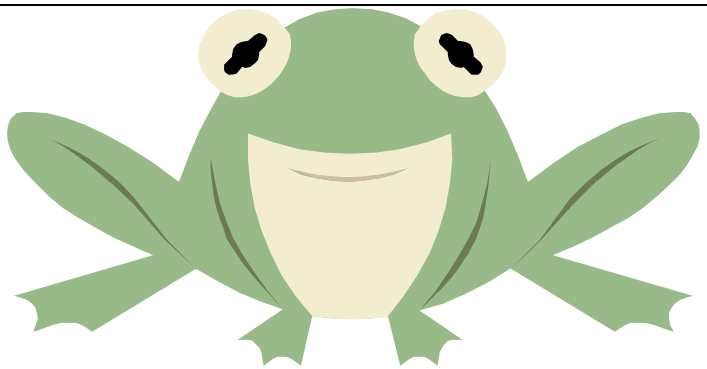
The area could be between 2 and 16 square units.



The area could be between 18 and 25 square units.



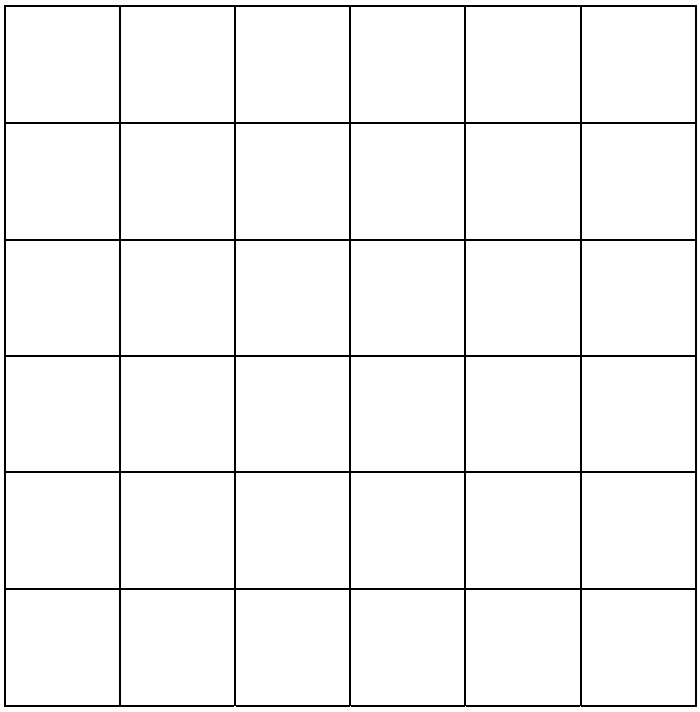
The area could be between 15 and 24 square units.



The area could be between 2 and 10 square units.

Step A Draw your new animal's cage. Remember it must have the same area as the cage you chose with your group!

My animal is a _____
The cage is _____ square units.



Step B Explain how you know the area you drew is correct. Use what you know about area in your explanation.

_____
_____
_____
_____

The Making of _____ Zoo

.

Directions:

1. Glue the two pieces of grid paper together. This is the space for your zoo.
2. Choose any five animals you want to include in the zoo.
3. Draw each cage for the animal and label the cage with the name of the animal. Remember large animals will need a larger area!
4. Complete "The Making of My Zoo" chart to include the animal, area, and perimeter information.

The Making of _____ Zoo

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Directions:

1. Glue the two pieces of grid paper together. This is the space for your zoo.
2. Choose any five animals you want to include in the zoo.
3. Draw each cage for the animal and label the cage with the name of the animal. Remember large animals will need a larger area!
4. Complete "The Making of My Zoo" chart to include the animal, area, and perimeter information.

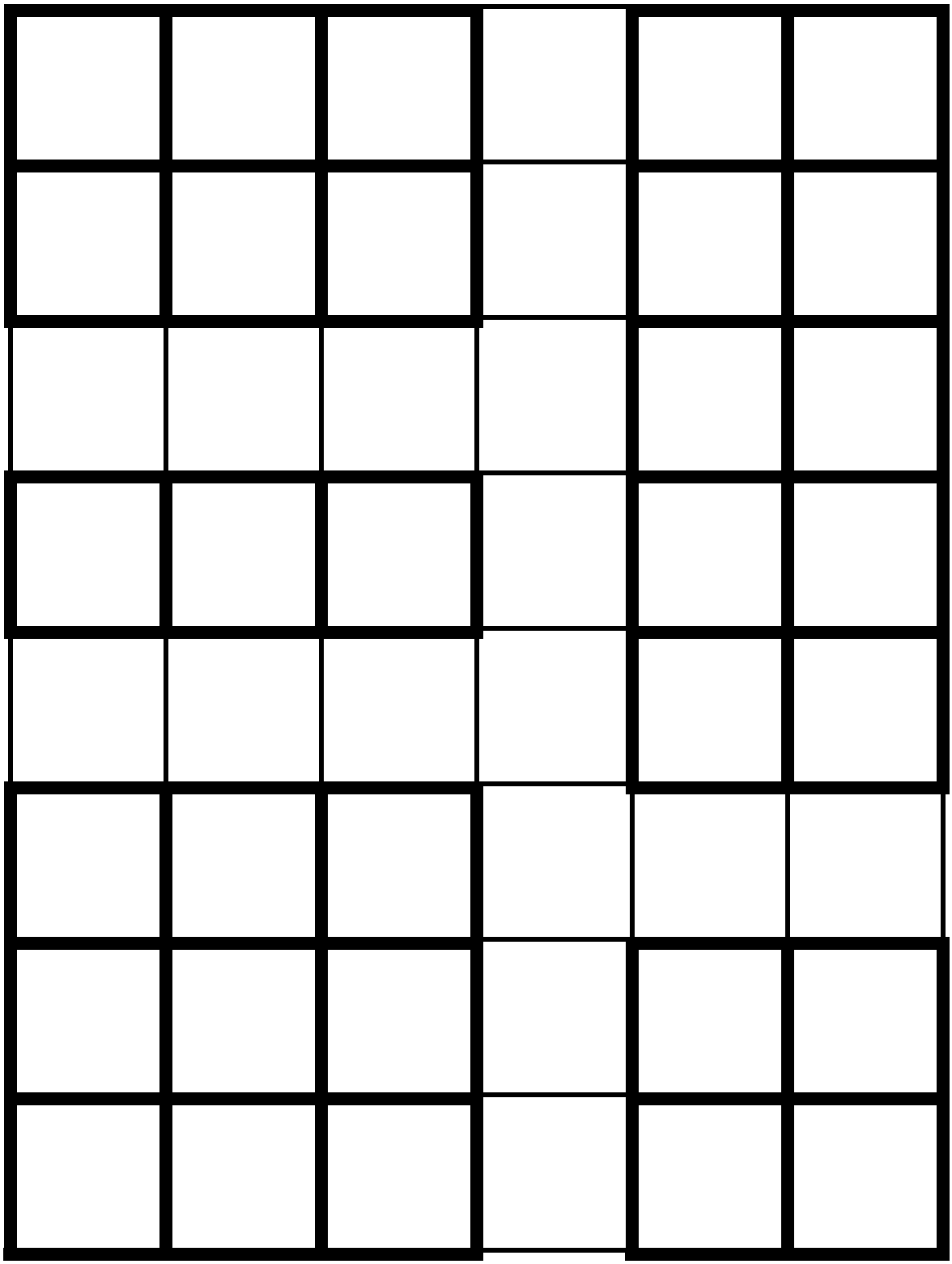
Student Resource 11

Name _____ Date_____

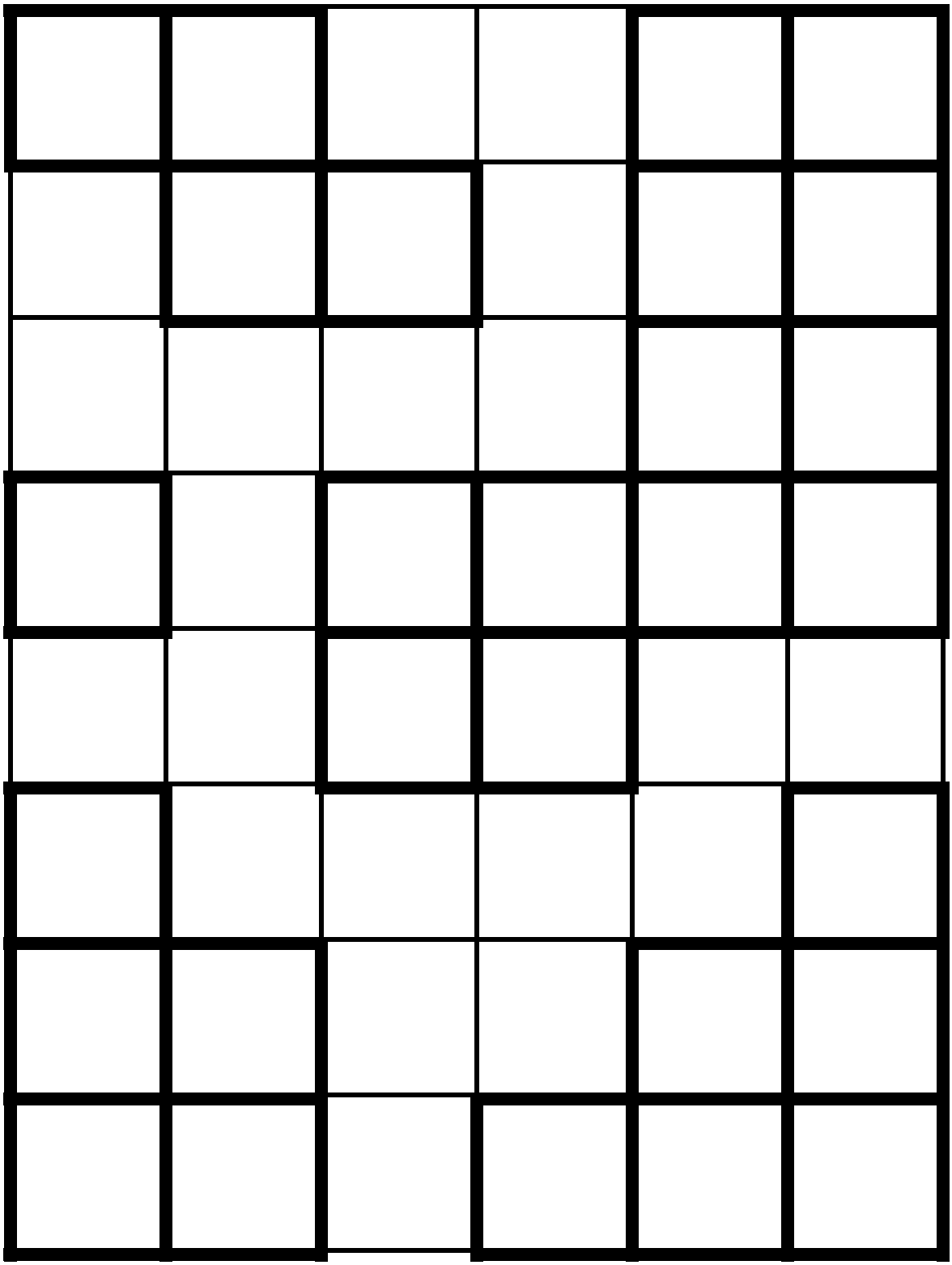
The Making of my Zoo

Zoo Name _____

Animal	Perimeter	Area



Student Resource 12B



Joe went to the Zoomanji Zoo. He started his tour at the snake exhibit. Joe was curious about the size of the snake cage. He used a measuring tool to find the area of the rectangular cage. Joe found that one side was 3 units long and the other side was 2 units wide.

Part A

What is the area of the cage?

_____

Part B

Joe also used the measurements to find the perimeter. He says the perimeter of the snake cage is 25 units. Explain why Joe is NOT correct.

_____

_____

_____

_____

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Teacher Resource 1A
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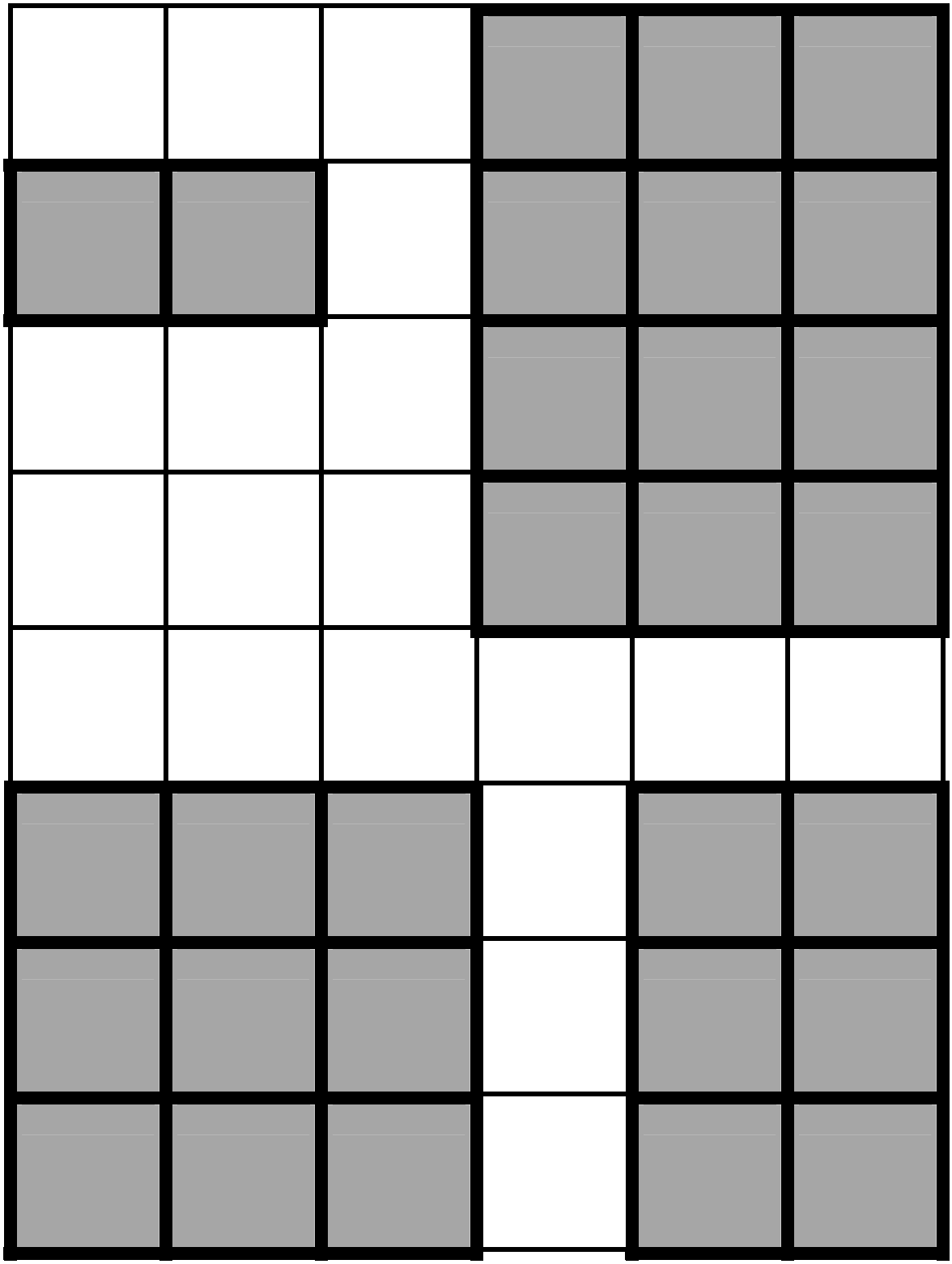

Teacher Resource 1B
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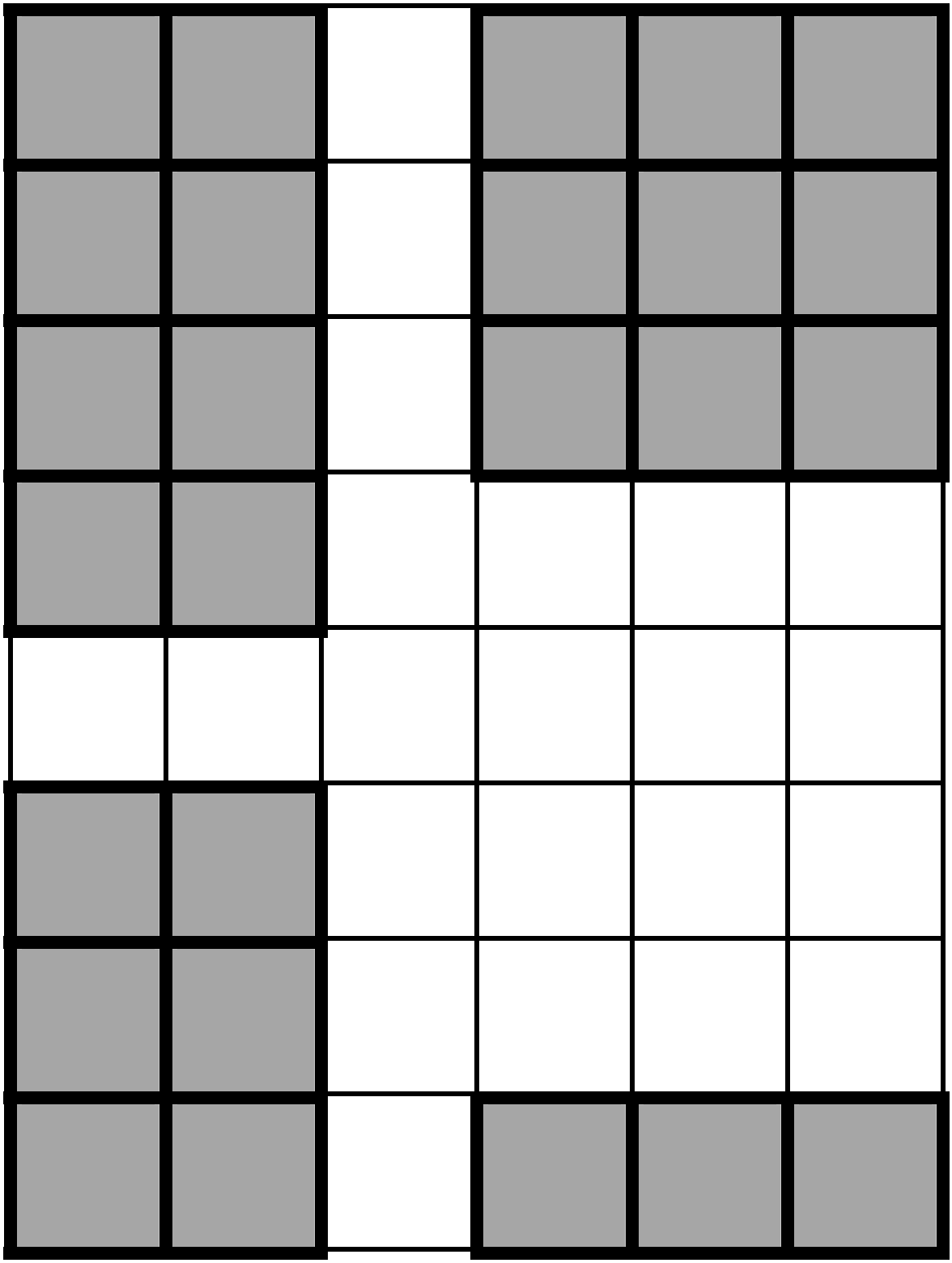

Teacher Resource 1C
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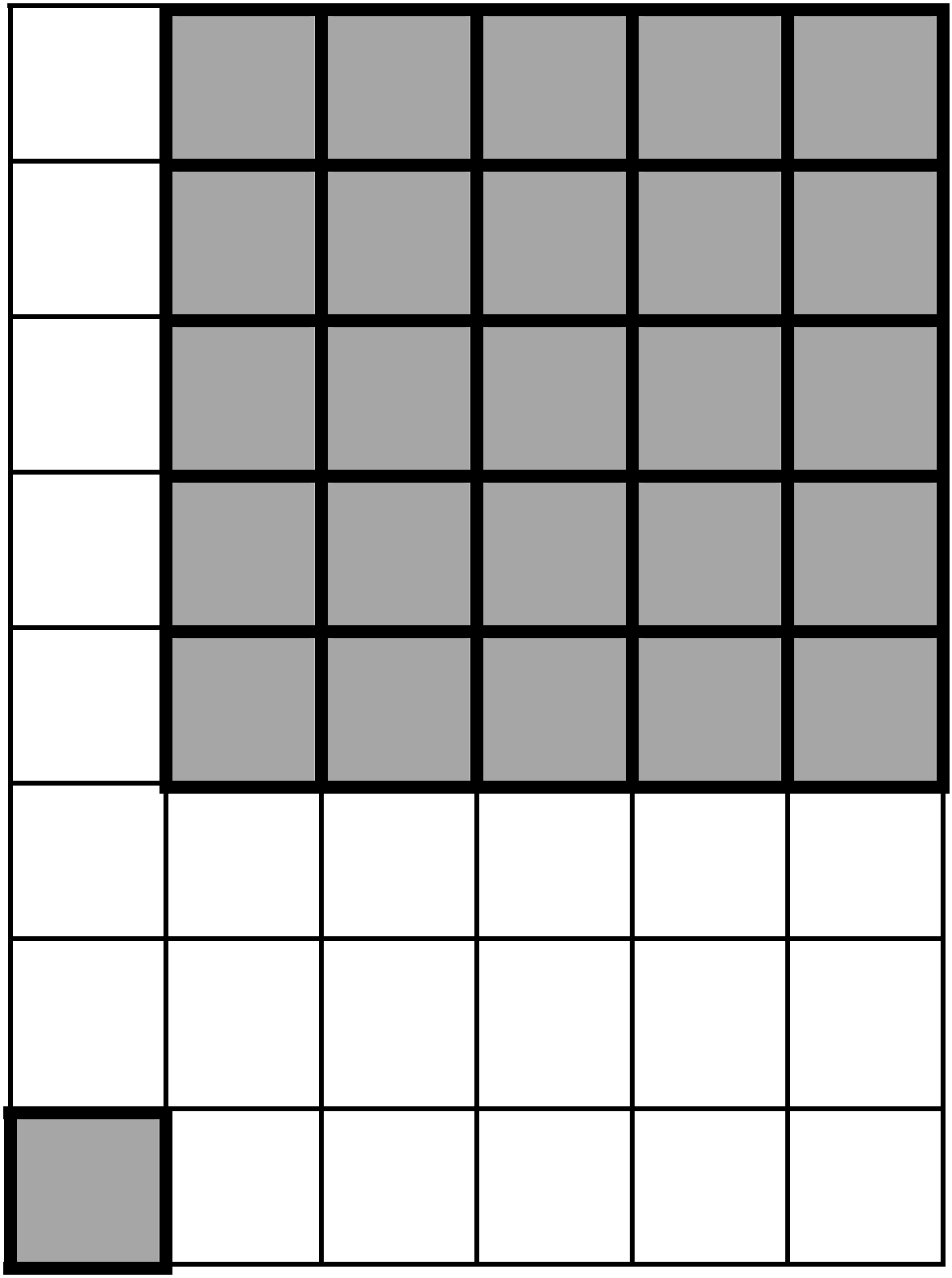

Teacher Resource 1D
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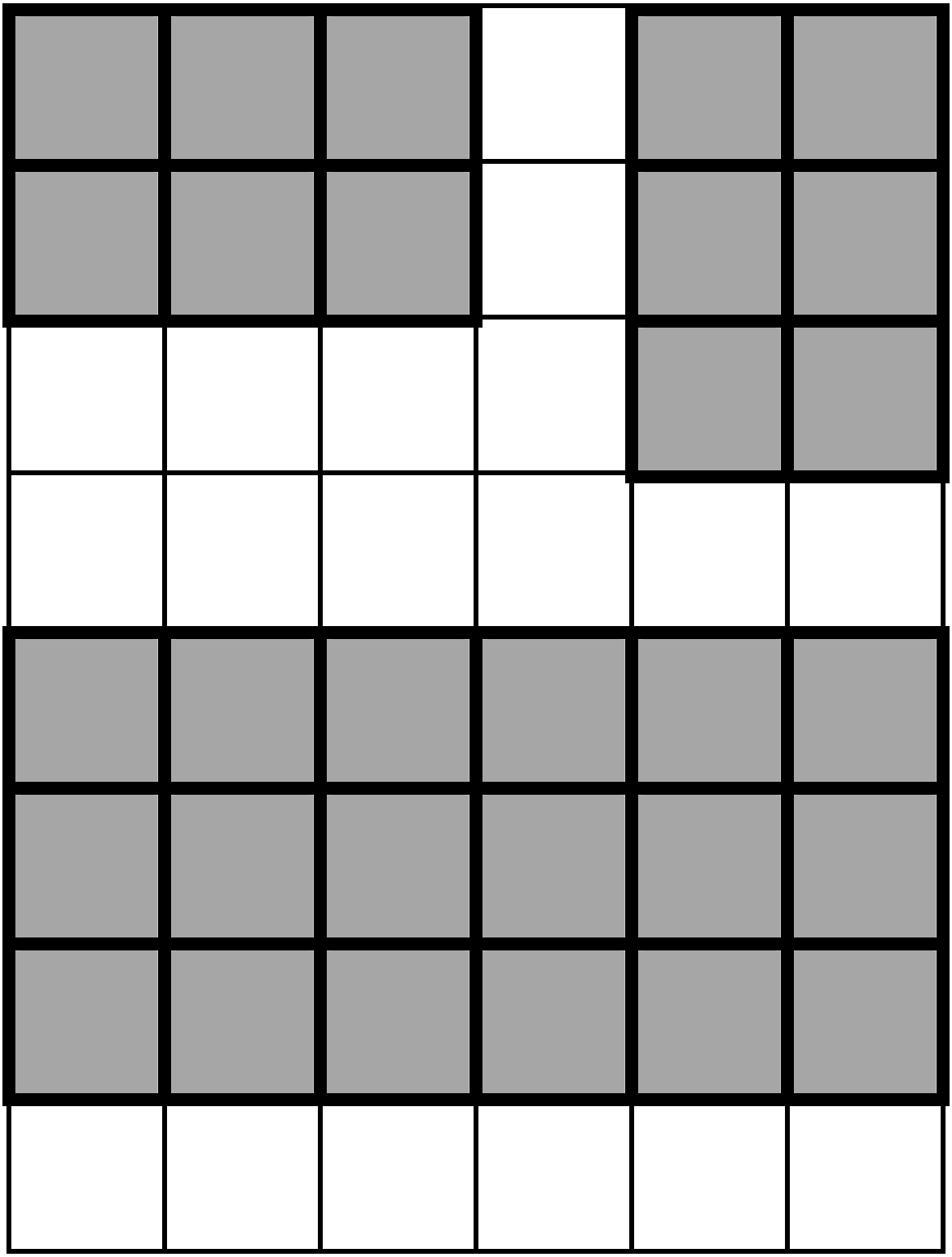

Teacher Resource 1E
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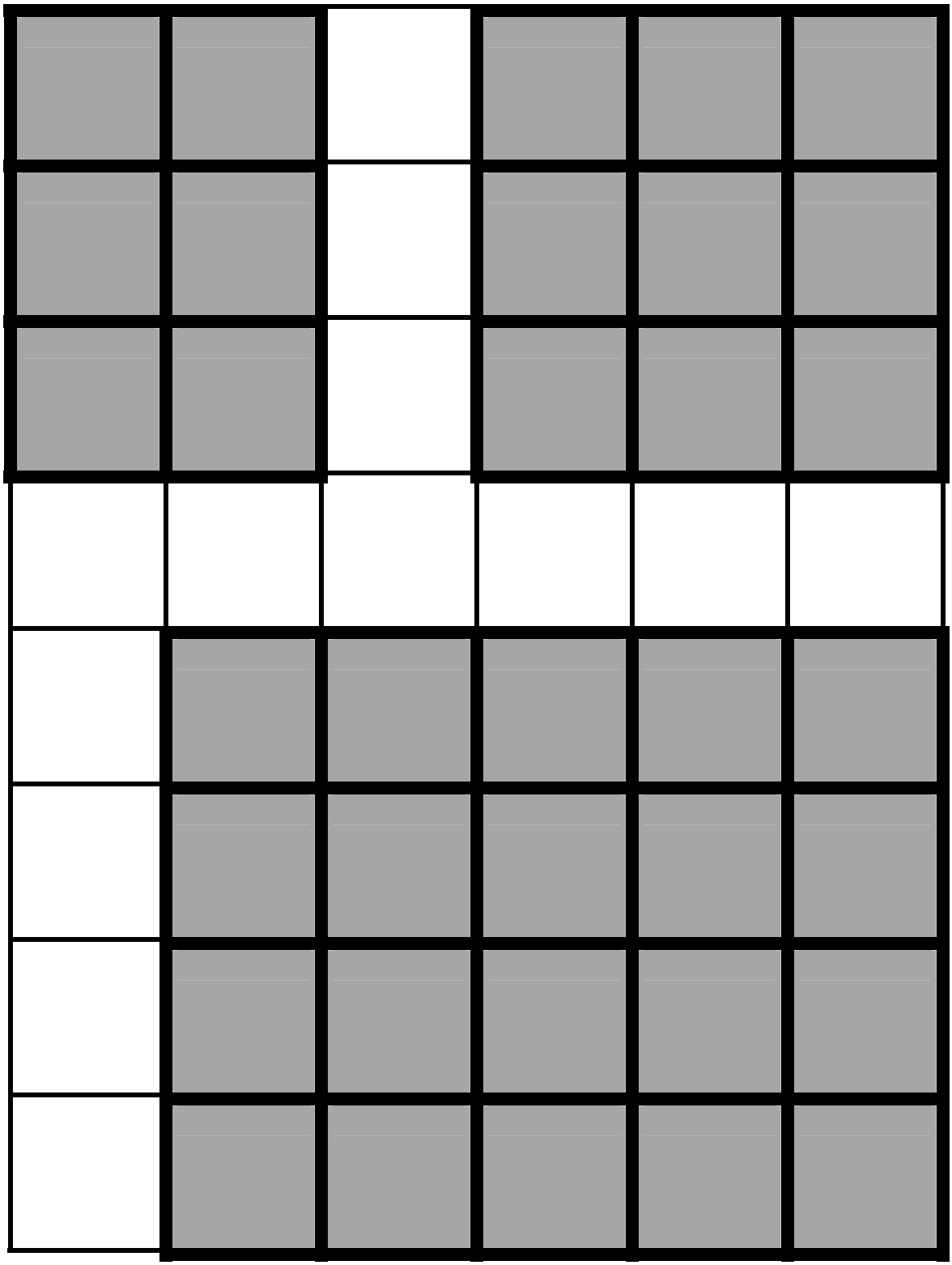

Teacher Resource 1F
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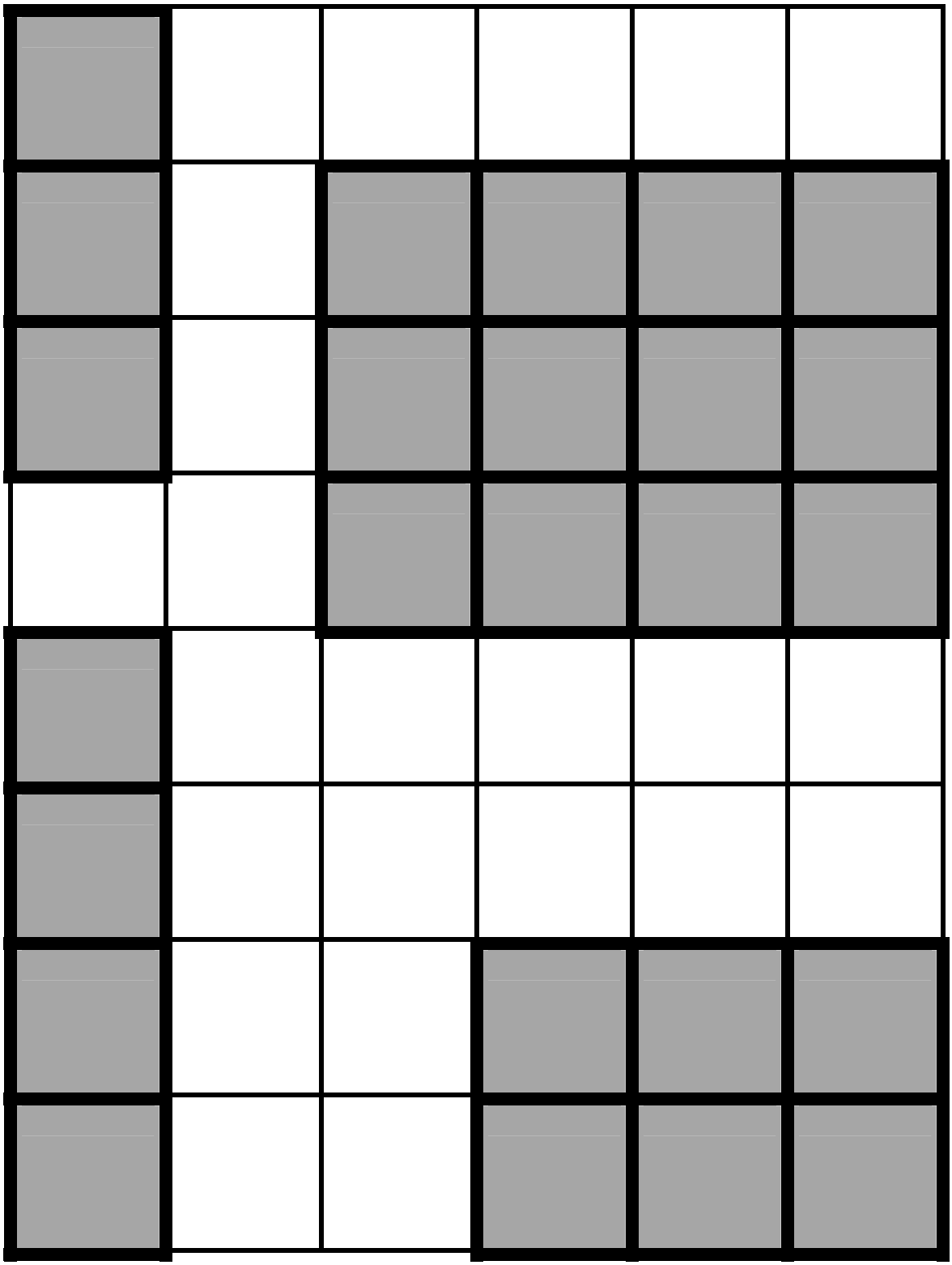
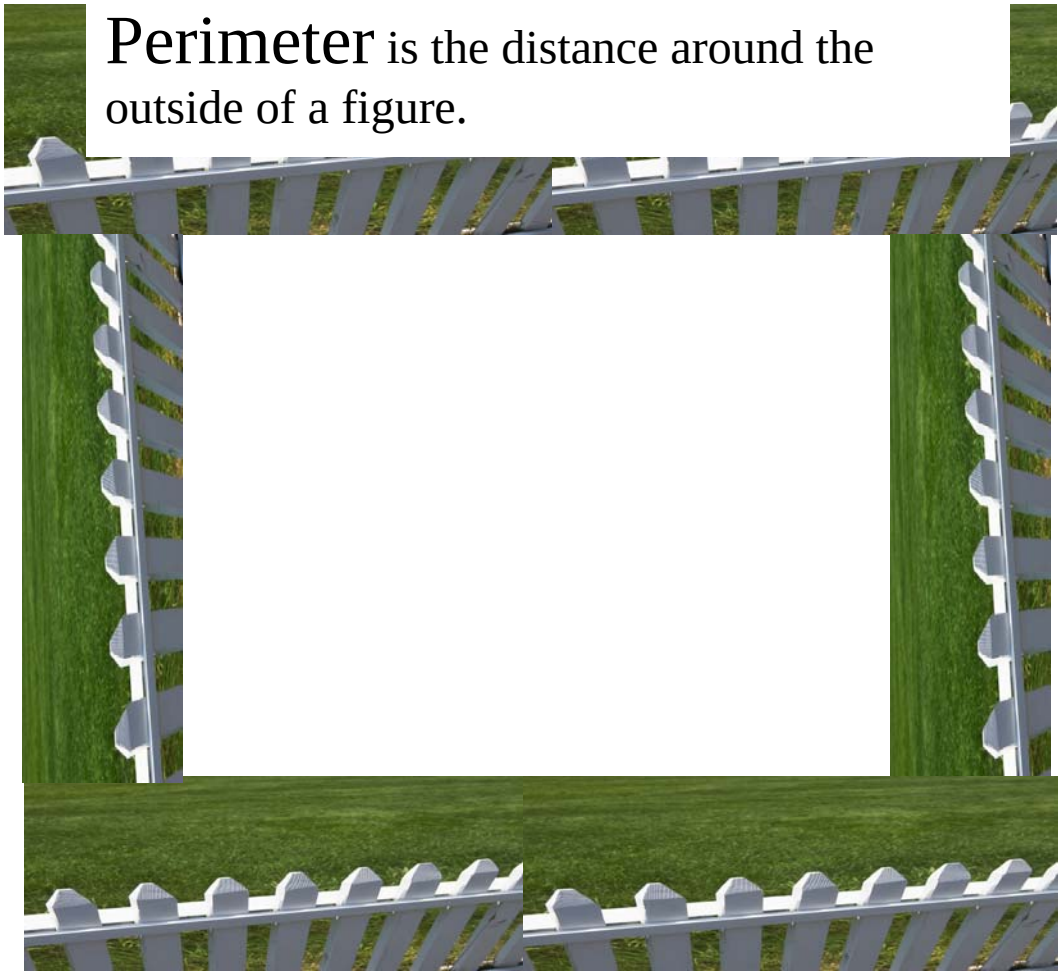
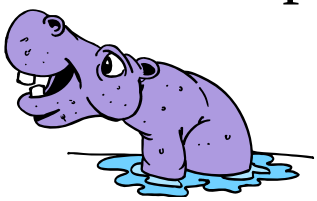



Perimeter is the distance around the outside of a figure.

Area is the measurement of space inside a shape.



Area

DEFINITION

Area – The number of square units needed to cover the inside of a figure.

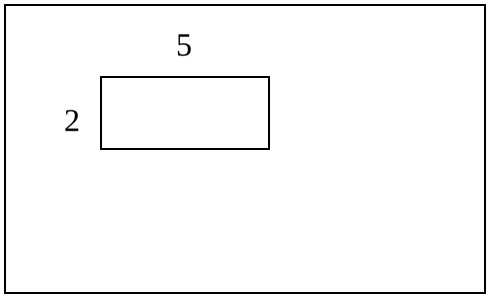
NUMBER SENTENCE

Answers may vary

4x3=12

2x2=4

DRAWING



REAL LIFE EXAMPLES

Tile Flooring

Top of Desk

Carpet

Teacher Resource 3A

Perimeter

DEFINITION

Perimeter – The distance around the outside of a figure.

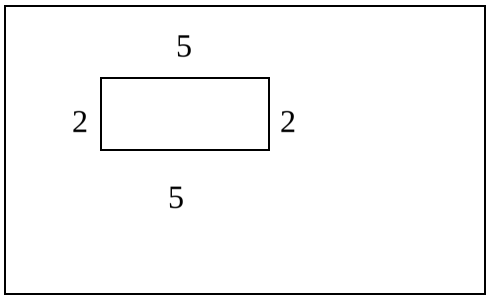
NUMBER SENTENCE

Answers may vary

3+4+3+4=14

2+2+2+2=8

DRAWING



REAL LIFE EXAMPLES

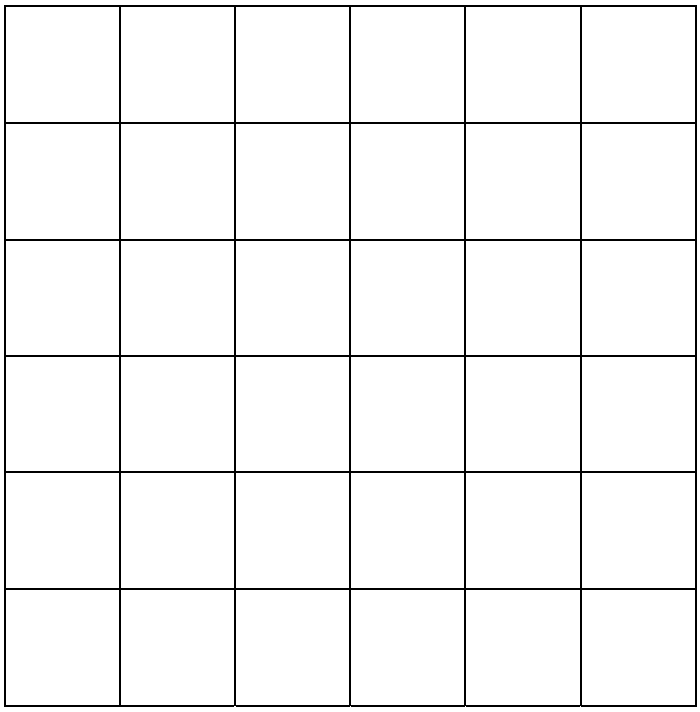
Fence

Desk Edges

Door Frame

Step A Draw your new animal's cage. Remember it must have the same area as the cage you chose with your group!

My animal is a _____
The cage is _____ square units.



Step B Explain how you know the area you drew is correct. Use what you know about area in your explanation.

I know my answer is correct because I had to make a cage with an area of _____ square units. I counted each square inside the cage and got _____. Area is the space inside a shape.

Area – 6 sq. units	Perimeter – 10 units			Area – 10 Sq. units	Perimeter – 14 units
Area – 3 sq. units	Perimeter – 8 units				
Area – 9 sq. units	Perimeter – 12 units				
				Area – 4 sq. units	Perimeter – 8 units

Area – 4 sq. units	Perimeter – 10 units			Area – 12 sq. units	Perimeter – 18 units
Area – 1 sq. unit Perimeter – 4 units					
Area – 5 sq. units					Area – 6 sq. units
Perimeter – 10 units					Perimeter – 12 units

Joe went to the Zoomanji Zoo. He started his tour at the snake exhibit. Joe was curious about the size of the snake cage. He used a measuring tool to find the area of the cage. Joe found that one side was 3 units long and the other side was 2 units wide.

Part A

What is the area of the cage?

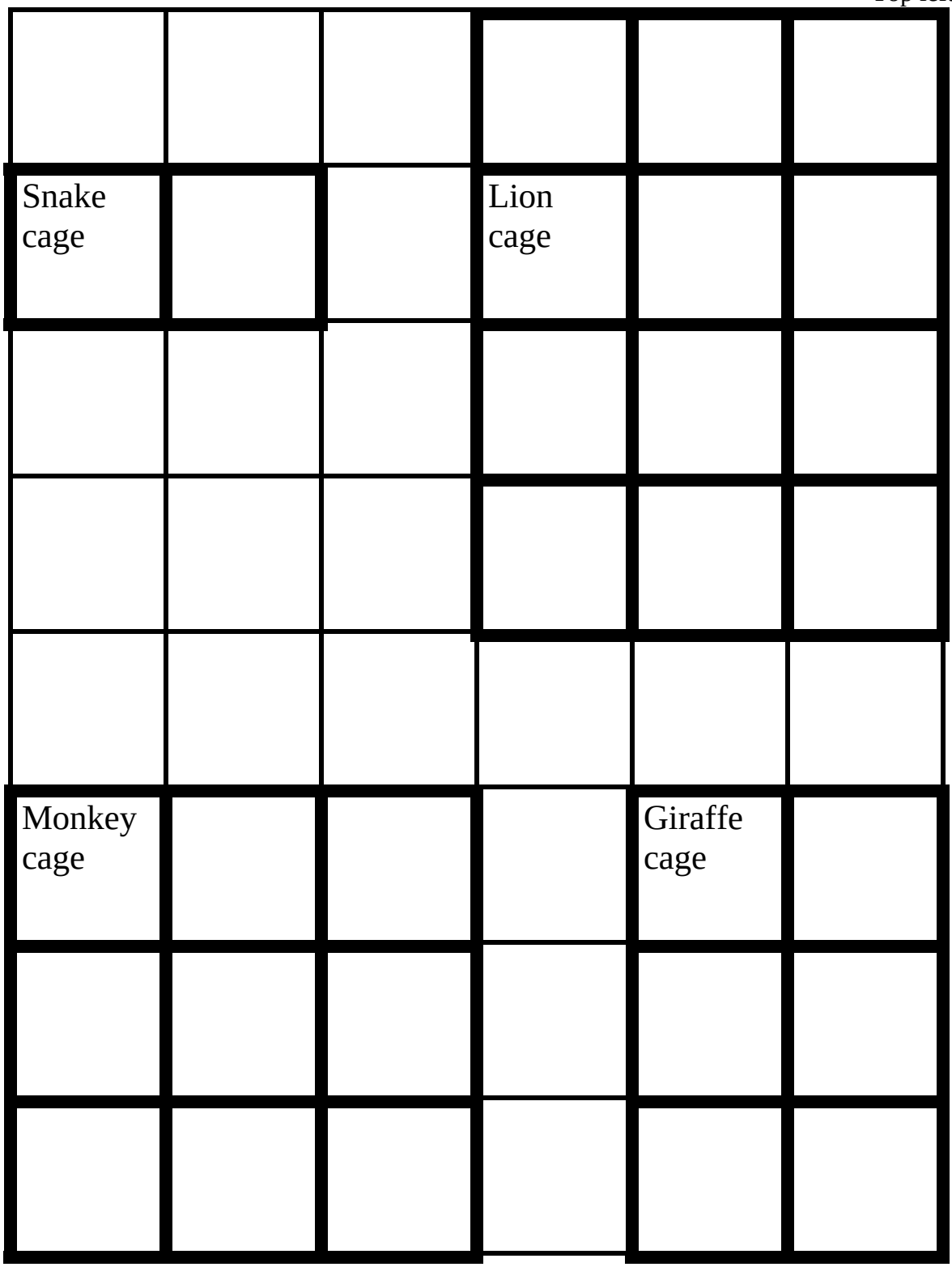
6 square units

Part B

Joe also used the measurements to find the perimeter. He says the perimeter of the snake cage is 25 units. Explain why Joe is NOT correct.

Joe is not correct because to find the perimeter I have to count the units around the cage. If the cage is a rectangle I know that the top and bottom are the same size and the two sides are the same size. Knowing this is true, I can add up all the sides around the cage. For example, 3+3+2+2=10.

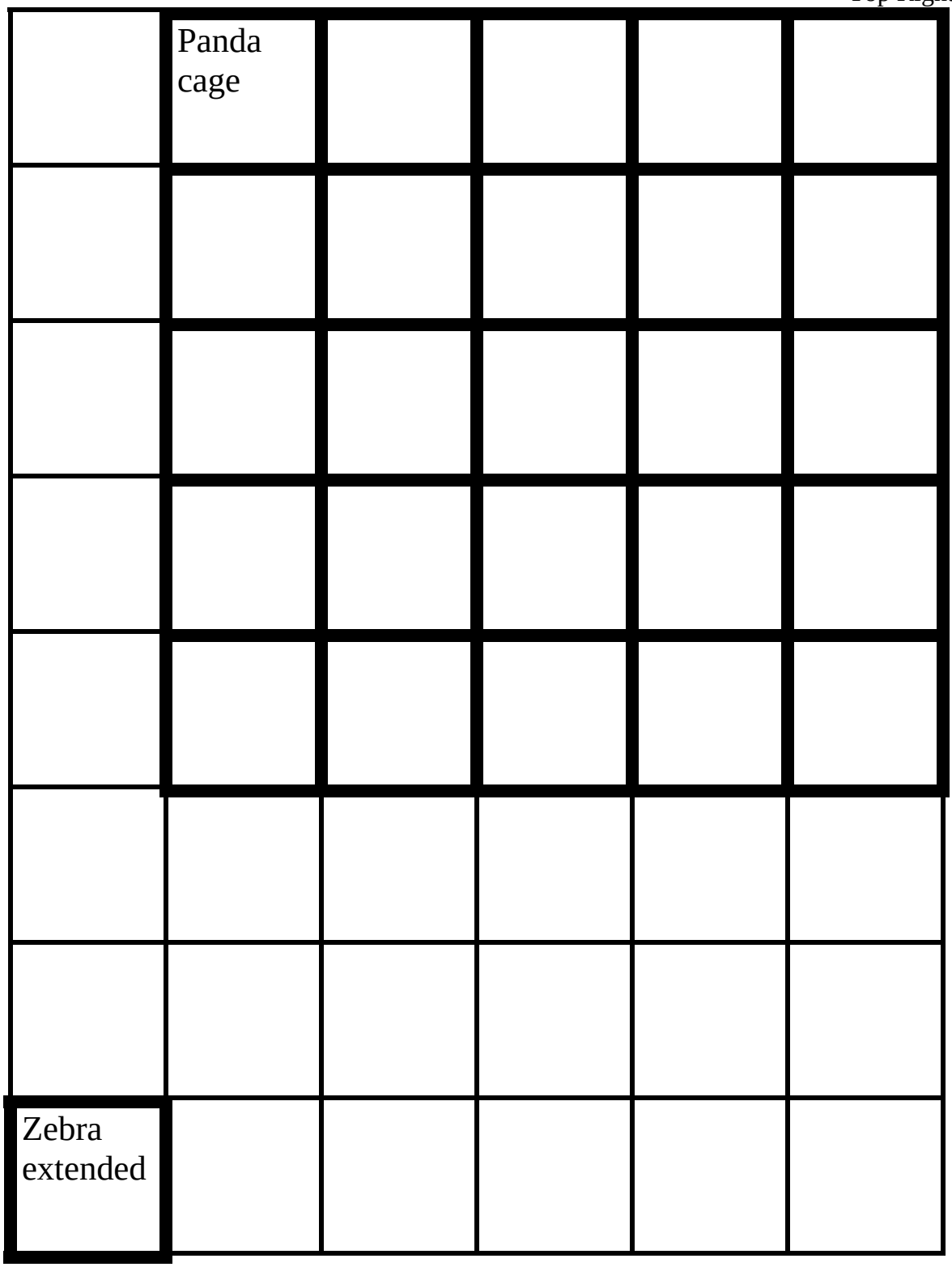
Teacher Resource 7A
Top left



Teacher Resource 7B
Top Middle

Lion cage extended			Penguin cage		
Giraffe cage extended					
			Top of zebra cage		

Teacher Resource 7C
Top Right



Teacher Resource 7D
Bottom left

Monkey cage extended				Giraffe cage extended	
Bear cage					

Teacher Resource 7E
Bottom middle

Giraffe cage extended			Zebra cage extended		
	restaurant				

Zebra cage extended					
		Jaguar cage extended			
Restaurant extended					
			Fox cage		